STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES

FOR

AIR QUALITY MONITORING

APPENDIX B

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

MONITORING AND LABORATORY DIVISION

FEBRUARY 1984

TABLE OF CONTENTS

APPENDIX B

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

TABLE OF CONTENTS (cont'd)

APPENDIX B

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

APPENDIX B

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

FIGURES

Page

TABLES

STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES

FOR

AIR QUALITY MONITORING

APPENDIX B.1

STATION OPERATOR'S PROCEDURES

FOR

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

MONITORING AND LABORATORY DIVISION

FEBRUARY 1984

B.1.0 GENERAL INFORMATION

B.1.0.1 THEORY

The Bendix Carbon Monoxide (CO) analyzer measures the amount of infrared light absorbed by CO in a sample of ambient air. The quantity of light absorbed is proportional to the concentration of CO in the air sample. A detailed discussion of the analyzer's measurement principle is contained in the Manufacturer's Instruction Manual. This appendix supplements the Manufacturer's Manual with instructions for servicing and troubleshooting the analyzer. Separate appendices are available for the analyzer acceptance test and calibration.

B.1.0.2 ANALYTICAL CYCLE

The analyzer monitors concentrations of CO present in an air sample by passing alternating nondispersive single beam infrared (IR) radiation through a sample and a reference cell to a detection chamber (detector). The sample cell is open to ambient air or calibration gas while the reference cell is sealed and filled with a gas such as nitrogen which will not absorb IR radiation. Without CO present in an air sample, the IR radiation intensity sensed by the detector is essentially equal between the two cells, resulting in no capacitance change and a zero electrical output. When CO is present, IR radiation is absorbed in the sample cell proportional to the concentration of CO, in PPM. The unequal intensity now sensed by the detector produces an output in the form of a capacitance change. This capacitance change is coupled to a capacitance to voltage converter producing an electrical signal suitable for a recording device. Figure B.1.0.1 illustrates the Bendix flow. For further details, refer to the Manufacturer's Instruction Manual.

B.1.0.3 CAUTIONS

1. Install the Bendix Model 8501-5CA in a vibration free location.

2. Prior to cleaning the analyzer, place the PPM selector switch and the PUMP power switch to the OFF position, and unplug the power cord. Avoid the use of chemical agents, which might damage components.

3. Use a third wire ground on this analyzer.

4. Adhere to general safety precautions when using compressed gas cylinders (e.g., secure cylinders, vent exhaust flows).

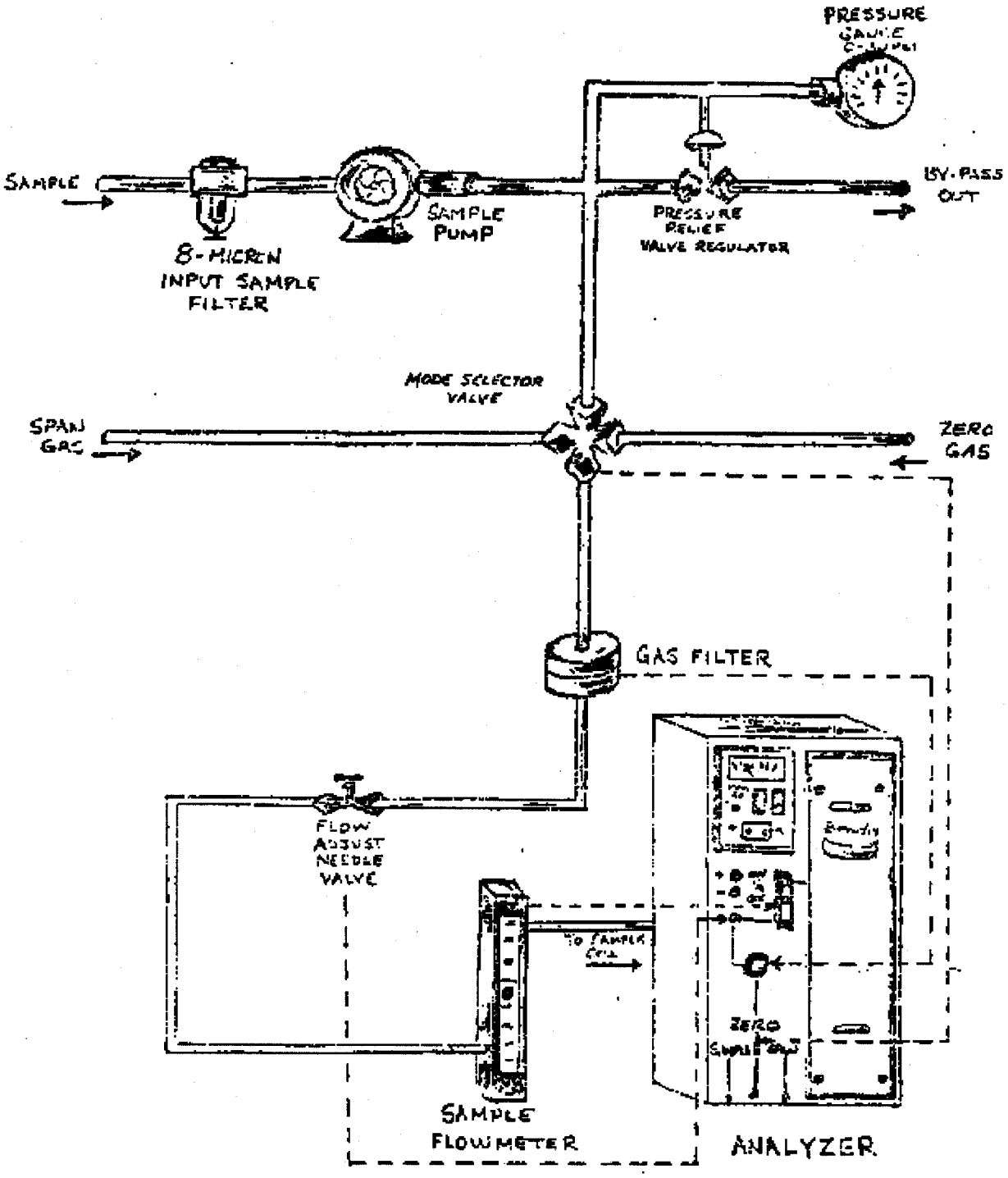

Figure B.1.0.1
Gas Flow Diagram

B.1.1 INSTALLATION PROCEDURES

B.1.1.1 PHYSICAL INSPECTIONS

1. Unpack the analyzer and check it for shipping damage.

2. Remove the 4 screws from the analyzer section cover and remove the cover. Check the plumbing for tightness (swagelok nuts should be finger tight plus 1/8 turn) and the cannon plugs and head assembly cover for security. Insure that the coaxial cable connector from the detector to the analyzer board is tight. Before replacing the cover, insure that the thumb screw is tight, locking the chassis in place.

3. Remove the 4 screws from the control module and slide it out. Check the general condition of the interior and verify that the board is secure; then resecure the control module with the 4 screws.

B.1.1.2 INITIAL START-UP

1. Connect sample, span, and zero gases to proper fittings on the back of the analyzer. Connect the "Vent" to an appropriate vent. Note: Do not pressurize this port.

2. Connect a recorder to the 10-millivolt output on the back of the control module.

3. Place the PPM selector switch to 500 (to prevent the meter from being damaged).

4. Turn on the analyzer in accordance with the procedure outlined in the Manufacturer's Manual. Observe that the power indicator lamp is illuminated. If not illuminated, find and correct the malfunctions. Then select the proper range.

5. Turn on the pump switch and check for an air flow indication. Then, check the pressure gauge on the rear of the analyzer to verify that it is between 5 to 9 psig. If there is no flow or pressure indication, refer to the troubleshooting section.

   Adjust the flow meter to 3.5 (approximately 600 sccm). If this flow cannot be obtained, loosen the locknut on the relief valve adjacent to the pressure gauge and adjust the screw to obtain the desired flow; then tighten the locknut.

NOTE: The analyzer's flow rate is not critical below 1000 sccm. Therefore, the flow rate should be adjusted to values between 400 and 1000 sccm. An increase in the flow rate will increase the response time. The ARB recommends approximately 600 sccm air flow.

B.1.1.3 ANALYZER ALIGNMENT

See Section B.1.3.5.

B.1.1.4 CALIBRATION

See Appendix B.3.

B.1.2 ROUTINE SERVICE CHECKS

B.1.2.1 GENERAL INFORMATION

The following routine service checks are performed in accordance with the attached maintenance schedule (Table B.1.2.1). Perform the checks at least at the prescribed intervals. Also attached is a copy of the Monthly Quality Control Maintenance Checksheet (Figure B.1.2.1) which should be completed weekly and the original forwarded monthly to the station operator's supervisor.

B.1.2.2 DAILY CHECKS

The front panel flow meter should indicate the flow representing approximately 600 sccm as indicated on the most recent calibration report. Adjust, if necessary. Check the recorder chart for indication of analyzer malfunctions.

B.1.2.3 WEEKLY CHECKS

All initial and final readings should be recorded on the Monthly Quality Control Maintenance Checksheet.

1. Zero - Check the analyzer zero using the procedure given in the Manufacturer's Manual. Adjust the zero if the deviation is greater than $\pm$.5% FS.

2. Span - Check the analyzer span using the procedure given in the Manufacturer's Manual. Adjust the span if the deviation is greater than $\pm$1.0% FS.

3. Sample Flow - The front panel flow meter should indicate a flow representing approximately 600 sccm. Adjust, if necessary.

4. Pump Pressure - Check the sample pump pressure. The pump pressure should be between 5 and 9 psig and constant. Adjust or replace the pump if the pressure is outside this range.

B.1.2.4 MONTHLY CHECKS

1. Monthly Quality Control Maintenance Checksheet - Monthly, forward the checksheet to your supervisor.

*2. Check the filters (see maintenance section of the Manufacturer's Manual).

* Change the filter when it is dirty (at least every three months).

B.1.2.5 SEMI-ANNUAL CHECKS

Perform a multipoint calibration as outlined in Appendix B.3.0.

B.1.2.6 ANNUAL CHECKS

1. Perform a CO_2 interference test as outlined in Appendix B.3.

2. Perform a H_2O interference test as outlined in Appendix B.3.

Table B.1.2.1

Maintenance Schedule For The
Bendix Model 8501-5CA Carbon Monoxide Analyzer

	Daily*	Weekly	Monthly	3-Month Intervals	Annual
Sample Flow	X				
Chart Trace	X				
Zero Check		X			
Span Check		X			
Pump Pressure		X			
Input Sample Filter Replacement				X**	
Gas Filter Cartridge Replacement				X**	
Quality Control Checksheet		X	X		
Clean Flowmeter	As Required				
H_2O Interference Test					X
CO_2 Interference Test					X

* or each day on which an operator is in attendance.

** Environmental conditions may require more frequent change.

CALIFORNIA AIR RESOURCES BOARD
MONTHLY QUALITY CONTROL MAINTENANCE Checksheet
BENDIX MODEL 8501 - 5CA CARBON MONOXIDE ANALYZER

LOCATION:_____ MONTH/YEAR:_____

STATION NUMBER:_____ TECHNICIAN:_____

ANALYZER PROPERTY NUMBER:_____ AGENCY:_____

DATE	READING: DIAL/CHART				GAS CYLINDER CONC.		SAMPLE FLOW SETTING		PUMP PRESS	FILTER ELECT. INTEGRATOR	
	ZERO		SPAN								
	AS FOUND	FINAL	AS FOUND	FINAL	S/N ZERO	S/N SPAN	AS FOUND	FINAL		IN/ OUT	TIME CONST. SETTING
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							
	/	/	/	/							

OPERATOR INSTRUCTIONS:

1) DAILY CHECKS: AIRFLOW (RECORD WEEKLY), CHART TRACE.

2) WEEKLY CHECKS: ZERO AND SPAN, PUMP PRESSURE.

3) THREE MONTH INTERVALS: CHANGE PARTICULATE FILTERS. DATE LAST CHANGED:_____.

4) SIX MONTH CHECKS: CALIBRATION (LINEARITY). DATE OF LAST CALIBRATION:_____.

5) ANNUAL CHECKS: CO_2 AND H_2O INTERFERENCE TESTS.

6) AS REQUIRED: CLEAN AIR FLOWMETER.

DATE	COMMENTS OR MAINTENANCE PERFORMED:

REVIEWED BY:_____ DATE:_____

Figure B.1.2.1
Monthly Quality Control Maintenance Checksheet

B.1.3 DETAILED MAINTENANCE PROCEDURES

B.1.3.1 INPUT SAMPLE FILTER 8 MICRONS

Use the procedure outlined in the Manufacturer's Instruction Manual.

B.1.3.2 GAS FILTER CARTRIDGE

Use the procedures outlined in the Manufacturer's Instruction Manual.

B.1.3.3 SAMPLE PUMP

Use the procedure outlined in the Manufacturer's Instruction Manual.

B.1.3.4 CLEANING THE ANALYZER

Use the procedure outlined in the Manufacturer's Instruction Manual.

B.1.3.5 ANALYZER ALIGNMENT

The following procedure covers the analyzer mechanical and electronic alignment. This procedure will minimize noise and drift and assure correct phasing of the detector signal with the chopper motor reference signal. The adjustments should only be performed upon installation or if excessive noise (>0.5% FS) or drift (>0.5% FS/day) occurs.

1. C-7 Adjustment (see Figure B.1.3.1) - Loosen the four screws securing the analyzer panel to the case and remove the panel. Loosen the captive screw and pull the chassis out of the case. Measure the voltage at TP 2 on the analyzer card with a digital voltmeter capable of a $\pm$1 mv resolution. The voltage should be 0 $\pm$ 10 mv. If necessary, adjust C-7 to obtain the correct voltage. If the detector cell or analyzer card is replaced, capacitors 241, 242, or 6 may have to be changed. Contact you supervisor for instructions.

2. Optical System Zero Balance (see Figures B.1.3.1, B.1.3.2, B.1.3.3, and B.1.3.4) - Connect an oscilloscope between TP 4 and ground on the analyzer card. Set the scope to read a maximum amplitude of 300 millivolts with the time generator off. With the analyzer sampling zero gas, minimize the AC peak to peak voltage (PPV) using the following procedure. (See note below for analyzers with the new optical bench. See Figure B.1.3.5 for a pictorial description of the new optical bench.)

a. Remove the head assembly (black cover). Loosen the lock screws on the IR source and center the source over the slot under the front lock screw. Retighten the lock screws.

b. Loosen the lock screws securing the chopper motor and reposition the chopper motor until the PPV is minimal and constant. (Some analyzers may require the use of a metric allen wrench on the chopper motor lock screws.) Retighten the lock screws.

c. Loosen the lock screws on the IR source. Reposition the IR source using the source alignment adjustment screw. At this point, the minimum, constant PPV should be present. Retighten the lock screws. This completes the zero adjustment of the optical bench.

NOTE: On analyzers with the new optical benches, neither the IR source nor the chopper motor can be repositioned. However, the detector may be adjusted to obtain the minimum AC PPV. This is done by centering the zero adjustment screw between the two red dots on the optical bench and readjusting the shading screws on the side of the optical bench. For fine adjustment, the zero adjustment may be moved slightly but in no instance should it be moved outside the red dots.

3. Phasing Adjustment (see Figure B.1.3.1 and B.1.3.4.) - Connect an oscilloscope between the input to the field effect transistors (the top of the limiting diodes C6, C7, C8, and C9 is a convenient place) and ground. With the analyzer sampling span gas on the normal range, the scope signal should be similar to one of the following:

If it is not, perform the following adjustments:

a. Reposition the pick off coil to obtain the proper signal.

b. If you cannot obtain the proper signal, you may need to reposition the magnet. Turn the analyzer power off. Unsolder the wire controlling power to the chopper motor (J10 PIN 5). Turn the analyzer power back on.

c. Using a small metric allen wrench, loosen the magnet and rotate it about 20 degrees in the opposite direction you were moving the pick off coil. Retighten the magnet.

d. Using a clip lead, temporarily reconnect the chopper motor power. Reposition the pick off coil to obtain the correct phasing and then permanently solder the wire back to the terminal. If you cannot obtain the correct signal, repeat steps c and d.

e. Replace the black cover on the head assembly. Flush with zero air and secure. Push the analyzer into the case and secure the captive screw, locking the chassis into place. Replace and secure the analyzer front panel.

4. Zero Adjustment (see Figure B.1.3.6.) - With the analyzer sampling zero air on the 0-50 PPM range, set the zero with the front panel zero pot. A properly aligned analyzer's zero pot should usually be between 400 and 600. As long as the analyzer shows no drift, it is acceptable to be outside this range.

5. Gain Adjustment (see Figure B.1.3.6) - Center the range trim potentiometers and set the front panel span pot to 500. With the analyzer sampling span gas on the 0-500 PPM range, set the large calibrator pot to read the proper span gas value. It is acceptable to use a 40 PPM gas. This adjustment is strictly a coarse gain adjustment. Return the analyzer to the desired range and calibrate using the procedure in Appendix A.3.

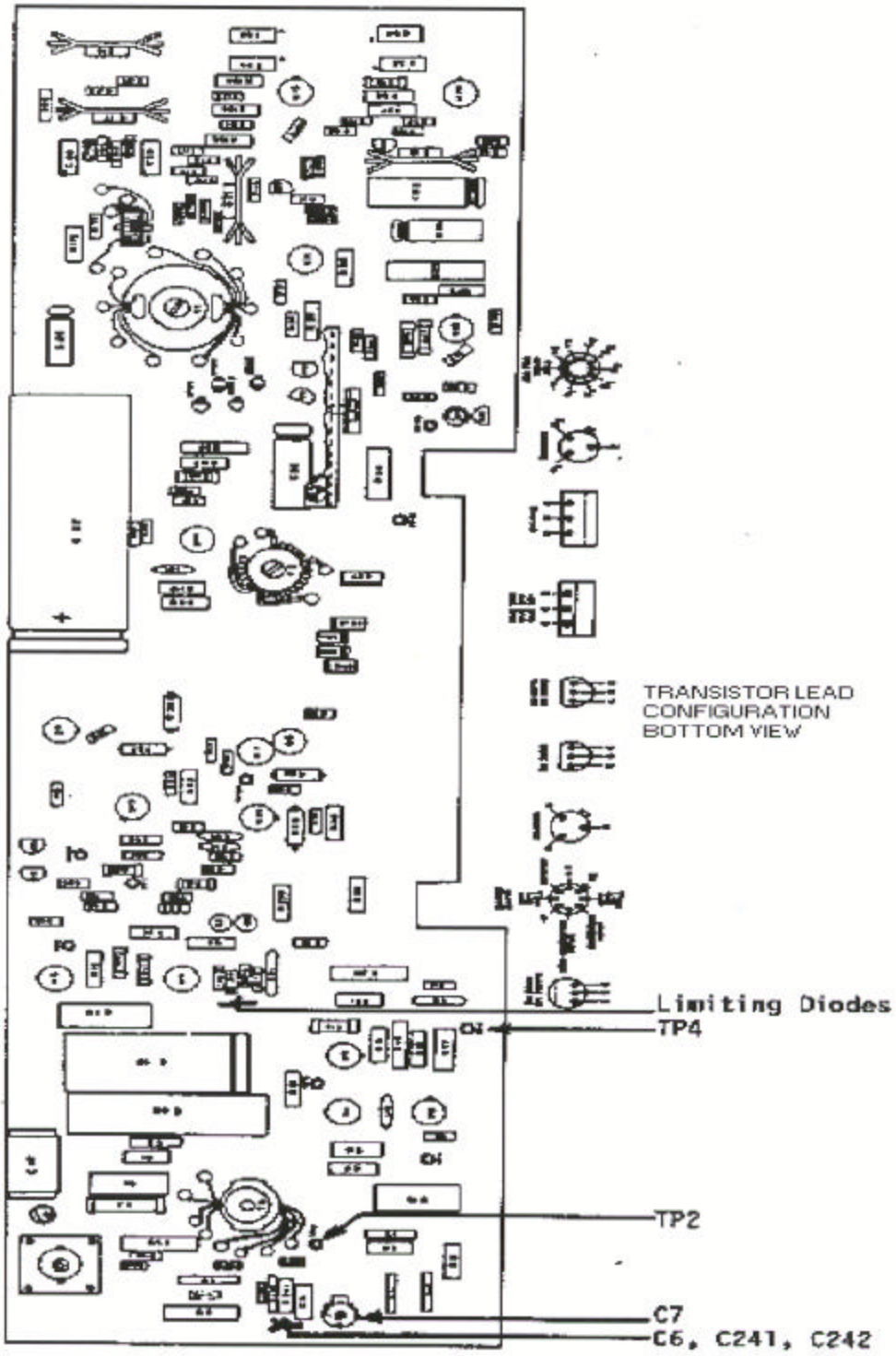

Figure B.1.3.1
Analyzer Card Component Parts

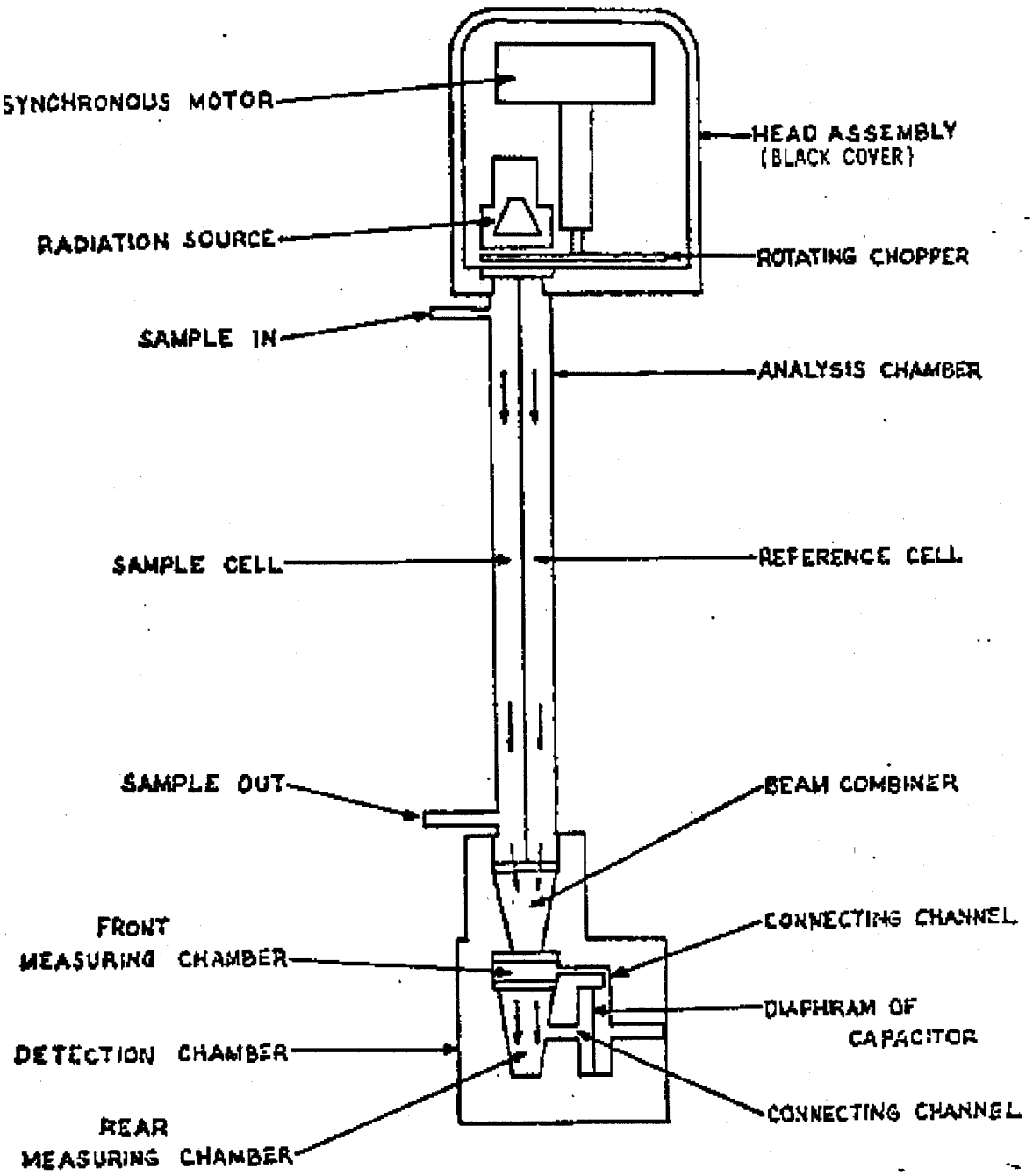

Figure B.1.3.2
Optical Bench Diagram

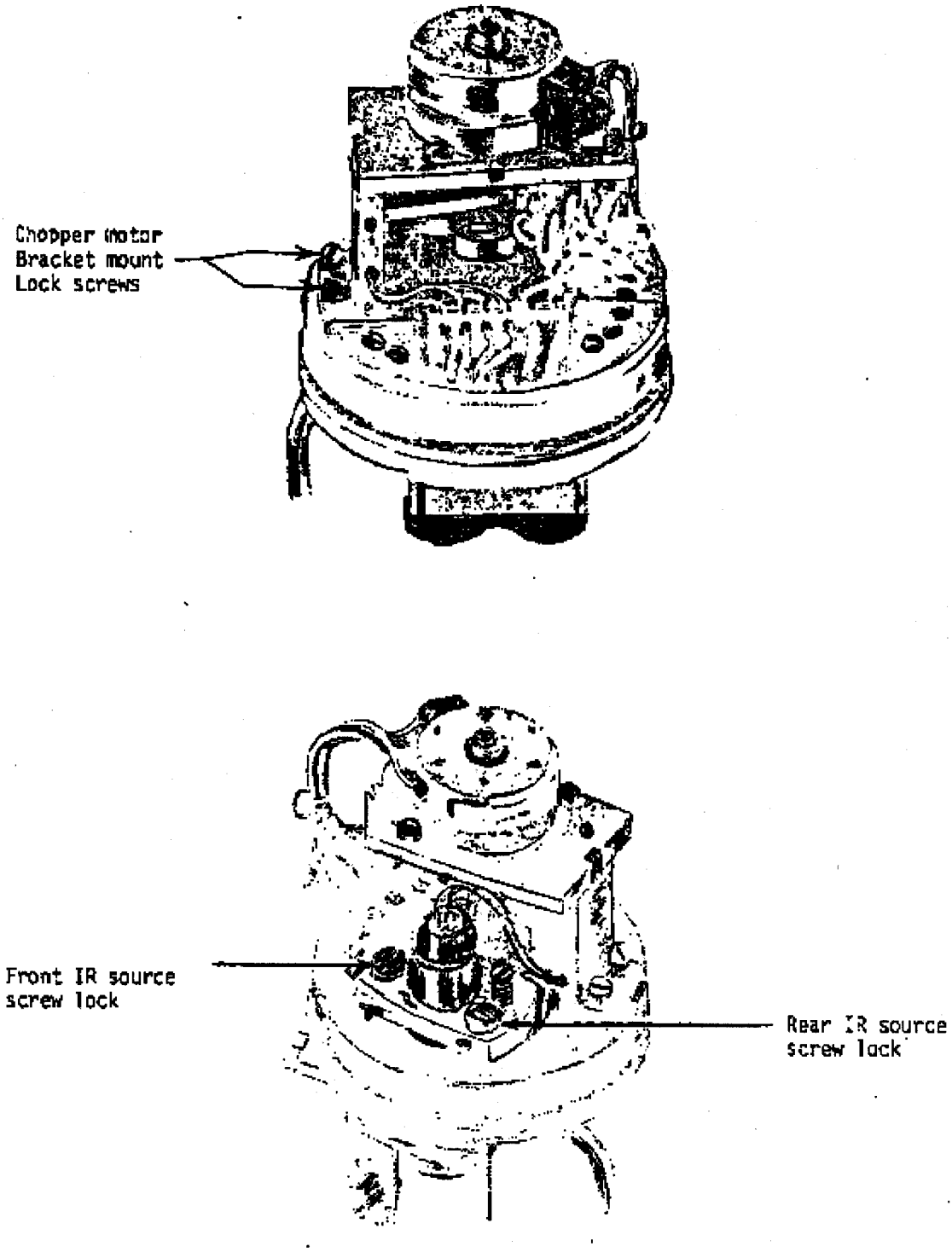

Figure B.1.3.3
Chopper Motor and IR Source Alignment Location of Lock Screw

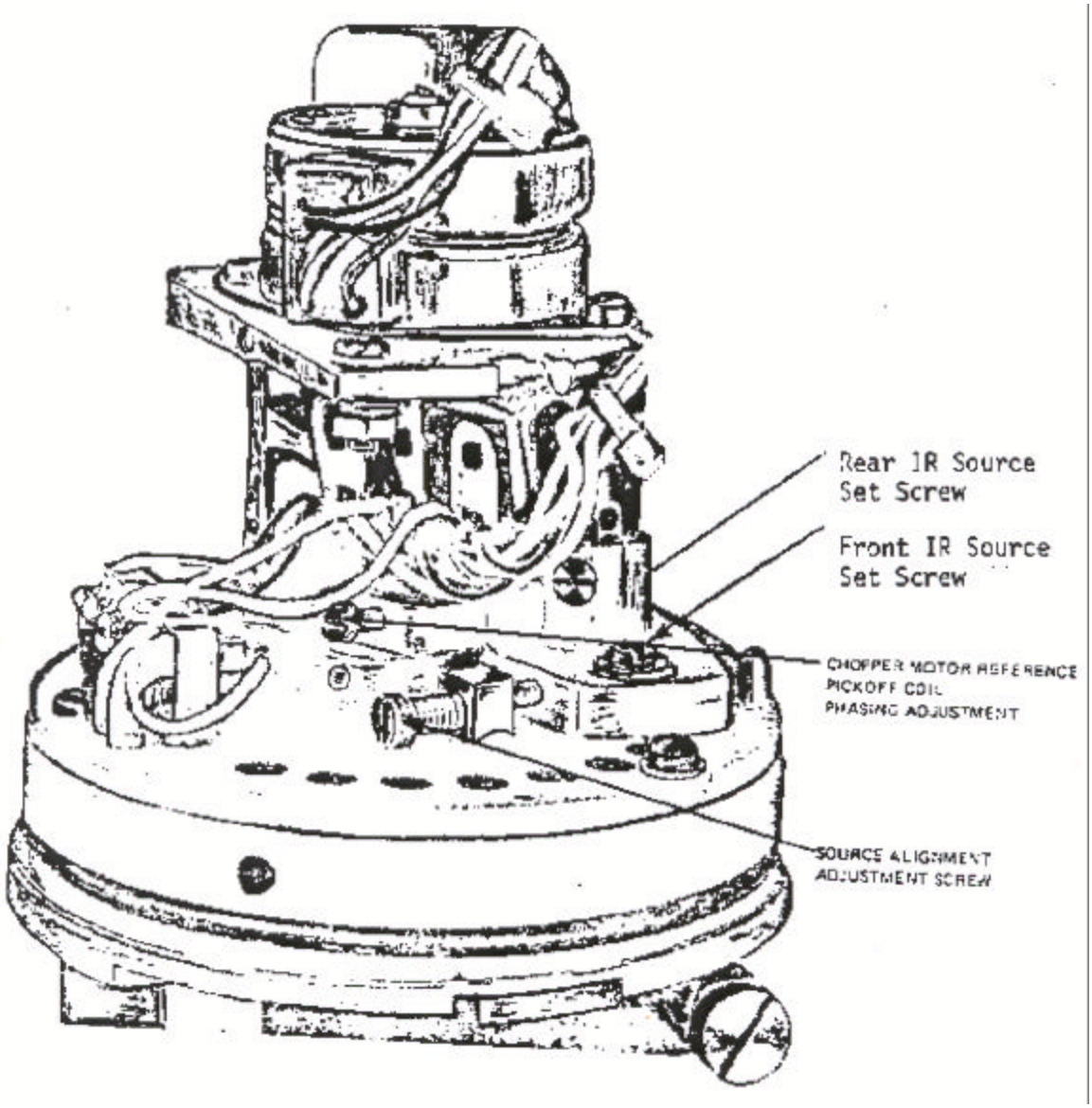

Figure B.1.3.4
Optical Bench and Phasing Adjustment

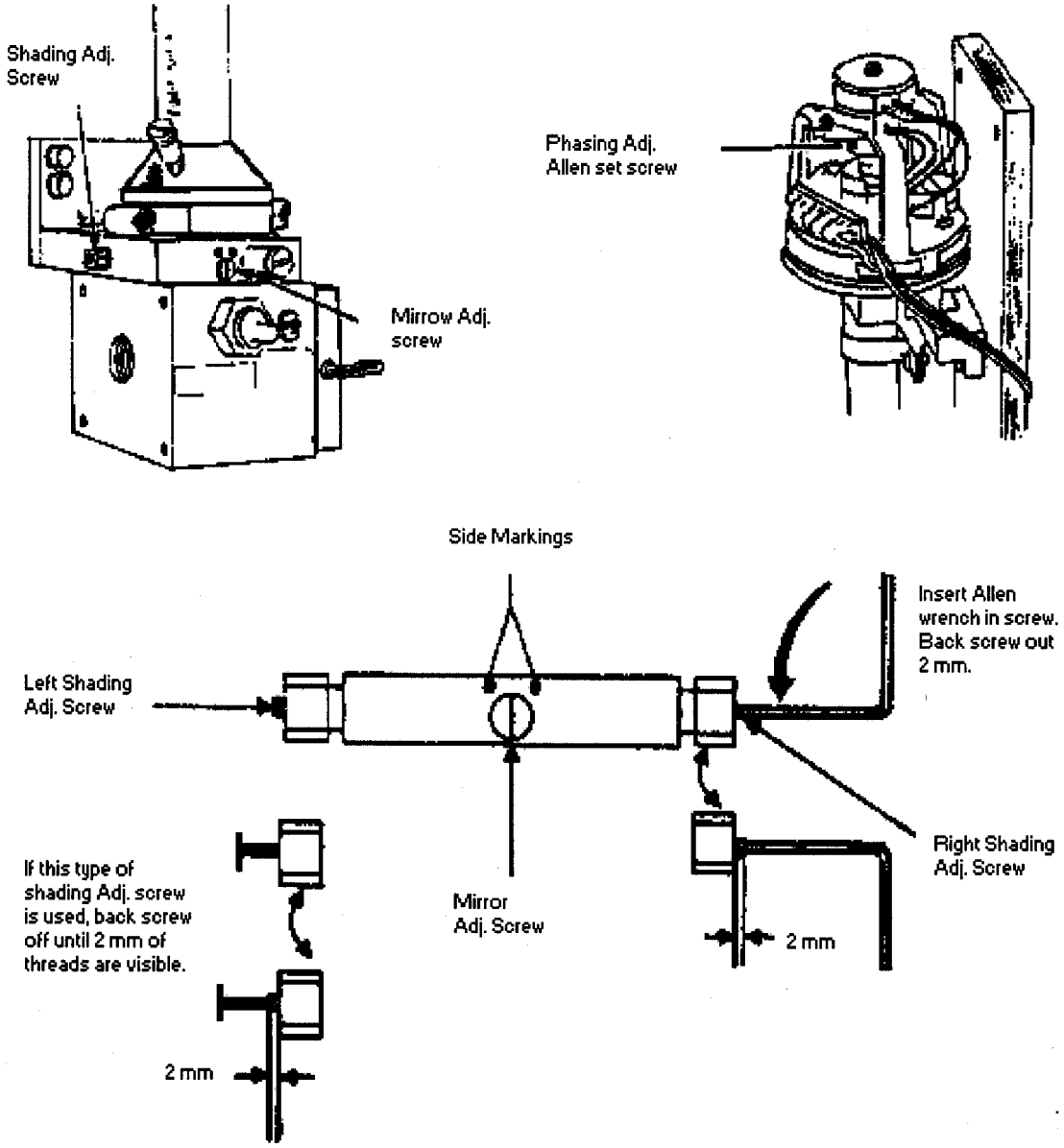

Figure B.1.3.5
Optical Bench - New

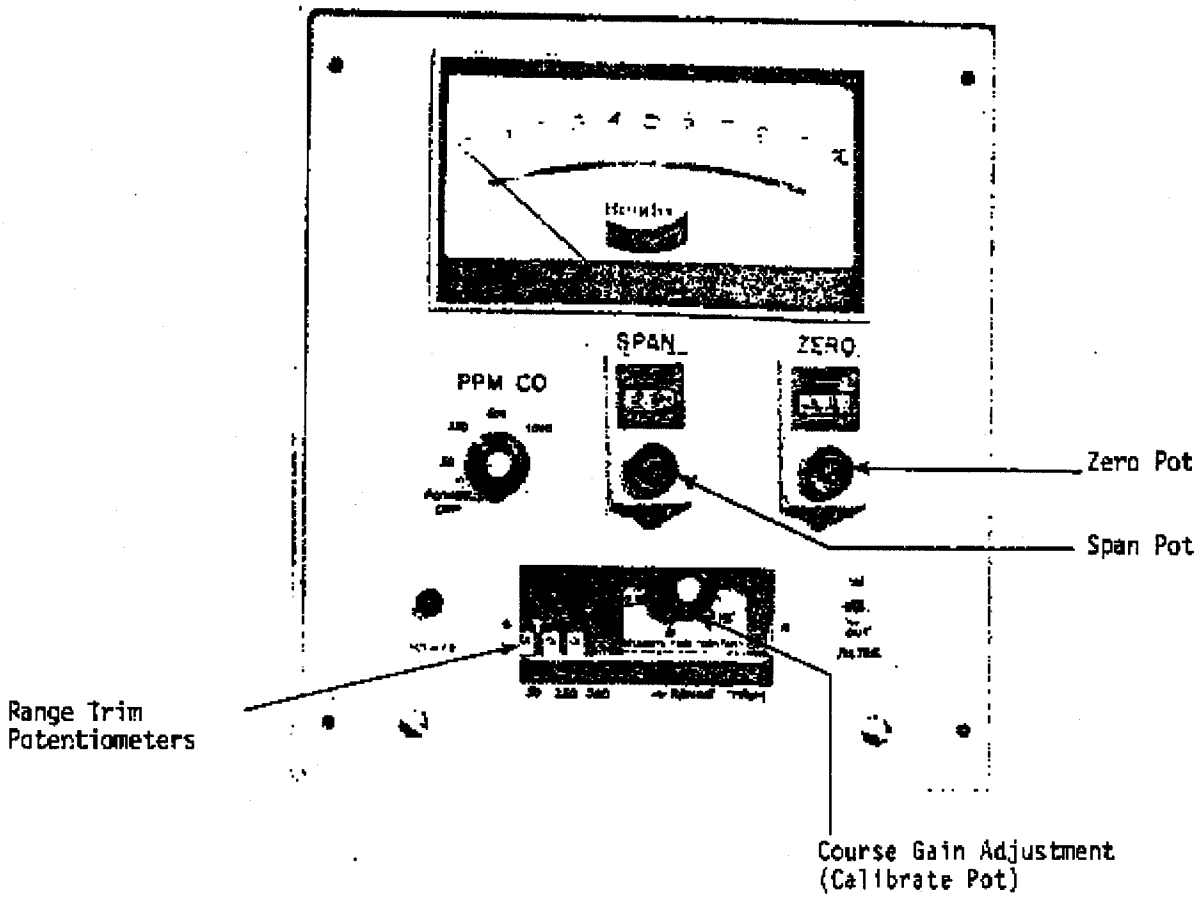

Figure B.1.3.6
Location of Zero and Calibration Pots

B.1.4 TROUBLESHOOTING

B.1.4.1 GENERAL INFORMATION

The Manufacturer's Instruction Manual contains information pertaining to troubleshooting and should be your first source of information. Additional problems which have occurred are outlined below. Space is provided on the Monthly Q.C. Checksheet for recording malfunctions, causes, fixes, and actions taken to prevent reoccurrence.

Cautions listed in Section B.1.0.3 should be observed. Additionally, when removing or installing printed circuit boards or other components, turn the analyzer off and remove the power cord.

B.1.4.2 ELECTRONIC MALFUNCTIONS

	Problem	Probable Cause	Fix
a.	Power indicator lamp is not illuminated.	Lamp burnt out.	Replace the lamp.
		*Fusible resistor R88 is open (10 ohms 5 watts)	Replace the resistor.
b.	PUMP indicator lamp is not illuminated.	Lamp burnt out.	Relpace the lamp.
c.	Zero and span drift.	Electronic drift.	Check C-7 voltage at TP-2 for 0 $\pm$ 10 mV and adjust if necessary. Also, check the zero balance and the phasing.
d.	Noisy trace.	Chopper motor binding.	Replace the motor.
		Spring drive slipping.	Replace spring drive.
e.	No output	Analyzer board malfunction.	Replace analyzer board.

*Note: Do not use the metal plate at the top of the analyzer board for a ground point as it will blow the fusible resistor.

B.1.4.3 OPTICAL MALFUNTION

	Problem	Probable Cause	Fix
a.	Analyzer will not respond to a known CO gas concentration.	Chopper motor and/or chopper drive spring broken.	Replace motor and/or drive spring.
		Chopper motor drive shaft is binding.	Correct by replacing motor.

B.1.4.4 FLOW MALFUNCTION

	Problem	Probable Cause	Fix
a.	Incorrect sample flow rate as indicated on the flowmeter.	Leak in system. Example: Loose drain cock at bottom of 8 micron filter.	Find and stop the leak.
b.	No indication on pressure gauge.	Broken gauge.	Replace with a known good gauge.
		Leak in line.	Leak check and repair.

B.1.4.5 PERIPHERAL EQUIPMENT MALFUNCTION

	Problem	Probable Cause	Fix
a.	Output noisy.	FILTER switch in OUT position.	Turn FILTER switch to IN position and set Time Constant to 16 seconds.
		Vibration.	Isolate analyzer from other equipment which may be causing vibrations.

STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES

FOR

AIR QUALITY MONITORING

APPENDIX B.2

ACCEPTANCE TEST PROCEDURES

FOR

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

MONITORING AND LABORATORY DIVISION

AUGUST 1978

B.2.0 ACCEPTANCE TEST PROCEDURES

B.2.0.1 GENERAL INFORMATION

The Manufacturer's Manual should be read thoroughly before beginning analyzer acceptance testing. In addition, a maintenance log book and an Acceptance Test Mini-Report (Figure B.2.0.1) should be initiated and pertinent information should be recorded.

B.2.0.2 PHYSICAL INSPECTIONS

1. Check the power cord phasing. Standard wiring configuration has the black wire connected to the brass terminal of the plug, white to copper and green to ground. Verify that the analyzer chassis is grounded to earth ground.

2. Perform the physical inspections as outlined in Section B.1.1.1.

B.2.0.3 OPERATIONAL TESTS

Perform the following checks and record the results on a mini-report and on the strip chart, which is retained in the Air Quality Surveillance files as a permanent record of the test performed.

1. Initial Start-Up - See Section B.1.1.2.

2. Analyzer Alignment - See Section B.1.3.5.

3. Line Voltage Test - Vary the input line voltage from 105 to 125 VAC in 5 volt increments (115 VAC, 110 VAC, 105 VAC, 110 VAC, 115 VAC, 20 VAC, 125 VAC, 120 VAC, 115 VAC) while injecting a known constant concentration of CO. Remain at each voltage step for at least 10 minutes. Full-scale deviation should not exceed $\pm$1%.

4. Zero and Span Drift

    a. Establish a stable zero trace, and then a stable span (80 PPM CO) trace (approximately 10 minutes) on a strip chart recorder using appropriate repeatable sources.

    b. At intervals of 24 hours and 72 hours, repeat the above zero and span points. Deviations should not exceed $\pm$1% of full scale for 24 hours or $\pm$2% for 72 hours.

5. Linearity Check - Check the linearity of the analyzer by injecting CO span gas into the sample port with concentrations of approximately 10% (10 ppm), 20% (20 ppm), 40% (40 ppm) and 80% (80 ppm) of full scale (100 ppm). Deviation from the known concentrations should not exceed ±1% of full scale.

6. Temperature Test - Place the analyzer in a temperature controlled environment. Establish a stable recorder trace utilizing a known concentration of CO span gas. Vary the ambient temperature from 4°C to 44°C in 5°C intervals of approximately 15 minutes each. Repeat the test while sampling zero air. Full scale deviations should be less than ±1% from the known concentration.

7. *Interference Tests - Using the procedures in Appendix B.3, test the analyzer for carbon dioxide and water vapor interferences.

8. Calibration - Perform a multipoint calibration on the analyzer using the calibration procedures outlined in Appendix B.3.

   NOTE: Analyzers must be calibrated for the range on which they will be operated.

B.2.0.4 FINAL REVIEW

If tests are satisfactory, an equipment relocation notification tag should be completed, and pertinent information such as final sample flow, zero, and span setting should be recorded in the log book and on the Acceptance Test Mini-Report. The analyzer is now ready for field use.

* A deviation of less than 1 PPM in either case is satisfactory.

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER
ACCEPTANCE TEST "MINI REPORT"

Date_____ Serial No._____ Reviewed by_____
By_____ ARB No._____ Date of Acceptance_____

		Pass	Fail	Final OK
I.	PHYSICAL INSPECTIONS			
	A. *Checked for shipping damage*.....	___	___	_____
	B. *Checked all electrical wiring*.....	___	___	_____
	C. *Checked all plumbing for leaks*.....	___	___	_____
	D. *Analyzer complete upon receipt*.....	___	___	_____

II. OPERATIONAL TESTS (All tests performed on 0-100PPM full scale)

A. *Analyzer alignment. Measure voltage at: (TP2)0±10mV_____mvV(TP6) <50mV_____mV*

	%FS Dev.	Pass	Fail	Final OK
B. *Electrical modes*.....	_____	___	___	_____
C. *Zero and Span Drift*				
1. *24 Hour Zero Drift*.....	_____	___	___	_____
2. *24 Hour Span Drift @_____ppm.*	_____	___	___	_____
3. *72 Hour Zero Drift*.....	_____	___	___	_____
4. *72 Hour Span Drift @_____ppm.*	_____	___	___	_____
D. *Line Voltage Test(105-125 VAC @____ppm)*..	_____	___	___	_____
E. *Temperature:*				
1. *Zero Shift: Step 1_____ ℃ to_____ ℃*...	_____	___	___	_____
Step 2_____ ℃ to_____ ℃...	_____	___	___	_____
Step 3_____ ℃ to_____ ℃...	_____	___	___	_____
2. Span@ ____PPM Step 1_____ ℃ to_____ ℃..	_____	___	___	_____
Step 2_____ ℃ to_____ ℃..	_____	___	___	_____
Step 3_____ ℃ to_____ ℃...	_____	___	___	_____
F. *Sample Flow Variation Test @____SLPM*....	_____	___	___	_____
G. *Linearity*				
1. *~80% Full Scale @_____ppm*.....	_____	___	___	_____
2. *~40% Full Scale @_____ppm*.....	_____	___	___	_____
3. *~20% Full Scale @_____ppm*.....	_____	___	___	_____
4. *~10% Full Scale @_____ppm*.....	_____	___	___	_____
H. *Interference Tests*				
1. *Carbon Dioxide (CO_2)*.....	_____	___	___	_____
2. *Water Vapor (H_2O)*	_____	___	___	_____

I. *Final Analyzer Readings*

Sample Flow:_____SCCM @_____ Flow Setting; Pump Pressure_____psig;
Zero Pot_____; Span Pot_____; Range_____ppm.

III. SPECIAL TESTS

_____

_____

_____

_____

IV. COMMENTS/MAINTENANCE PERFORMED

Figure B.2.0.1
Acceptance Test "Mini Report"

STATE OF CALIFORNIA

AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME II

STANDARD OPERATING PROCEDURES

FOR

AIR QUALITY MONITORING

APPENDIX B.3

CALIBRATION PROCEDURES

FOR

BENDIX MODEL 8501-5CA CARBON MONOXIDE ANALYZER

MONITORING AND LABORATORY DIVISION

FEBRUARY 1984

B.3.0 CALIBRATION PROCEDURES

The multipoint semi-annual calibration of the CO analyzer is no longer being performed. Instead, perform a monthly review of the Dasibi calibrator CO results to verify the analyzer is operating within control limits. Annually, perform CO_2 and H_2O interference tests.

B.3.0.1 APPARATUS

1. A compressed gas cylinder containing less than 0.1 PPM CO (zero gas).

2. Two stage brass regulators with 0-2000 psig first stage, one-quarter inch tubing and associated fittings for connecting a compressed gas cylinder to the analyzer.

3. A compressed gas cylinder containing approximately 750 PPM CO_2 $\pm$10%.

4. H_2O saturator (one 500 cc erlenmeyer flask is acceptable).

B.3.0.2 STATISTICAL CHECKS

Monthly, obtain the latest copy of the Dasibi Gas Calibration System - Monthly Statistical Analysis. Review the statistics for the auto-program: the "% difference" results for CO run at three concentrations bi-weekly. If any percent difference is greater than 10%, adjust the analyzer zero and span (see Section B.1.2.3).

1. CO_2 Interference Test - Perform a CO_2 interference test of the analyzer once a year as follows:

   a. Perform the analyzer zero check as outlined in Figure B.3.0.1.

   b. Remove the zero gas inlet line from the rear of the analyzer and install a line from a compressed CO_2 gas cylinder (approximately 750 PPM $\pm$10%).

   c. Open the valve on the CO_2 gas cylinder and adjust the regulator to obtain approximately 600 sccm of sample flow.

   d. Record a 10-minute steady trace and record the test and any deviation from the zero gas concentration on the Monthly Quality Control Maintenance Checksheet.

e. If the deviation from the zero gas concentration is greater than 1 PPM it may be necessary to replace the detector system. Contact your supervisor for further instructions.

f. Label each operation on the recorder strip chart.

2. H_2O Interference Test - Perform a H_2O interference test of the analyzer once a year as follows:

a. Perform an analyzer zero check as outlined in B.3.0.1.

b. Remove the sample inlet line and install an H_2O saturator and a pressure regulator in series as shown in the drawing below. Plug the line to the station sample manifold. Close the pressure regulator.

c. Open the valve on the zero gas cylinder and adjust the cylinder regulator to 10 psig to obtain approximately 600 sccm of sample flow, as indicated on the analyzer flow meter. Slowly open the pressure regulator. Allowing too much air to pass through the saturator may cause water to be drawn into the analyzer.

d. Record a steady 10 minute recorder trace and record the test and any deviation from the zero gas concentration on the Monthly Quality Control Maintenance Checksheet.

e. If the deviation from the zero gas concentration is greater than 1 ppm, it may be necessary to replace the detector system. Contact your supervisor for further instructions.

f. Label each operation on the recorder strip chart.

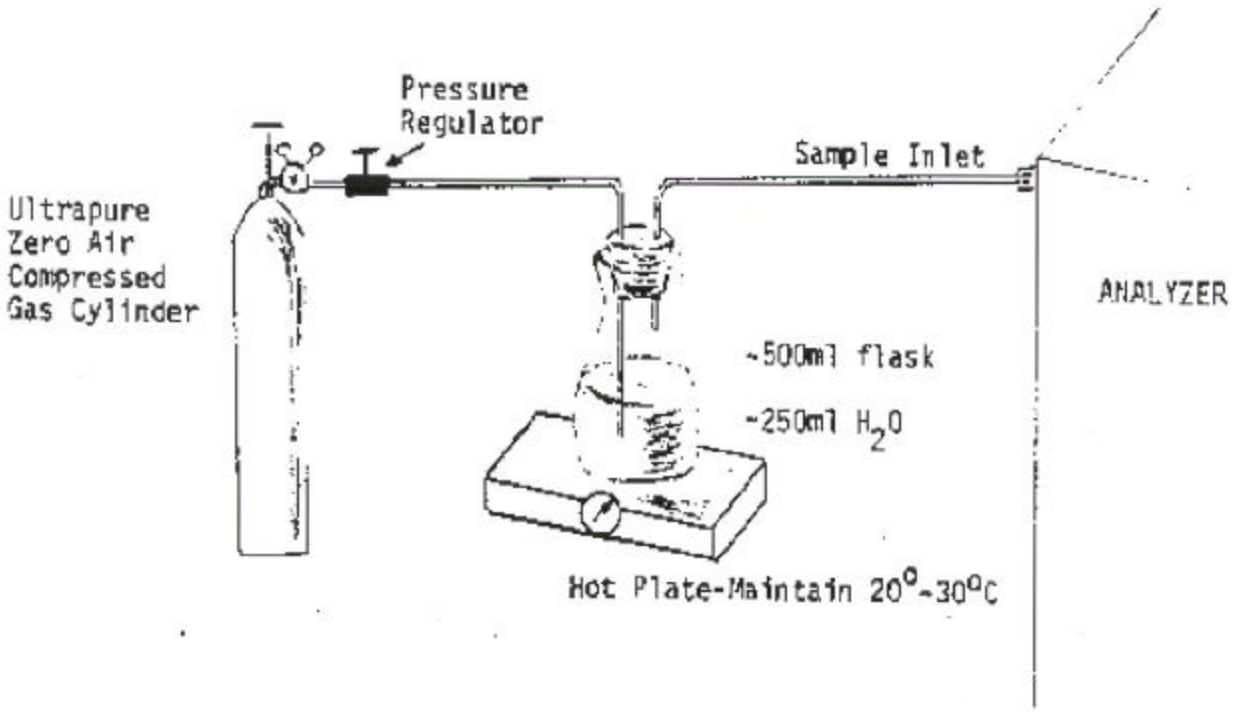

Figure B.3.0.1
Analyzer Zero Check Apparatus